

# Characterizing Planetary Habitability with the NASA Terrestrial Planet Finder Missions

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Within a decade, NASA's *Kepler* and Space Interferometry Mission will use indirect techniques to conduct a survey of both distant and nearby stars, to search for the existence of terrestrial planets. These missions will likely be the first to identify a potentially habitable world outside our Solar System, and their statistics on the prevalence of terrestrial planets will provide crucial contributions to our understanding of the distribution of habitable worlds in our Galaxy. Although these missions will provide the first order characterization of the planets they find, including, size, mass, planet-star separation and orbital period, they cannot tell us directly about the planetary environmental conditions, including the presence and nature of an atmosphere, and whether or not the planet is indeed habitable. Direct information on the planetary conditions will be gleaned in the next decade by the NASA Terrestrial Planet Finders and the ESA Darwin mission, using low-resolution, disk-averaged spectroscopy from space-based platforms. These first-generation planet characterization missions necessarily have considerable limitations on accessible wavelength, spectral resolution, sensitivity, and temporal sampling. This presentation will explore what could be learned about the habitability of nearby extrasolar terrestrial planets, and the specific detectability of key characteristics such as atmospheric and surface composition, within the context of the likely observational capabilities of the Terrestrial Planet Finder missions. This presentation will also describe how the synergistic combination of information from several missions could be used to provide a more robust determination of extrasolar planetary habitability and the presence of life.